Assignment 3 - Sample Questions

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Here, we provide a collection of questions that require the geometrical, topological, network, or raster computations using PostGIS functionalities. Similar questions will be included in Assignment 3.

Question 1

Consider a flight from Melbourne (MEL:37.6709S, 144.8433E), to London (LON: 51.4700N, 0.4543W), via Singapore (SIN, 1.3644N, 103.9915E). Compute, in percentage and in kilometres, how much longer is the flight with the stopover in SIN compared to a hypothetical direct flight. You only need to report a result as a table with one record, with two values, “percent” and “kilometres”. For the percentage, report the value as a multiplicative result over the direct distance.

Question 2

List the names of the 10 world countries with population greater than 25000 people having the shortest borders. The output should include attributes in the following order, named consistently: country name (“name”), border length (in kilometres, “border”) and population (“pop”). Order your output in ascending order of border length. Use the population available in “pop_cntry” column of the “world_countries” table.

Question 3

Imagine you are planning a cross-country trip from the US state of Utah to Illinois. List, in alphabetical order the names of all interstates (i.e., highways) that directly connect Utah with Illinois. Name the returned column “interstate_name”.

Question 4

Give the name (“name”) and population density (“pop_density”) of the countries that share the border with Brazil, ordered by decreasing shared border length. Use the geometry columns of the table “world_countries” to determine the length of the borders and also for calculating the population density (where Population Density = Population / Area in Square Kilometres).

Question 5

A tank truck has travelled from Pelham St (Node 1926) to the BP petrol station (Node 1416) traversing the shortest path via Swanston St (Node 311) and Elgin St (Node 1844). Due to the malfunction in the tank, the truck was leaking petrol on its way contaminating everything in a 20m radius. Your task is to report the total size of the contaminated area in square metres. You can use the tables “carlton_edges” and “carlton_nodes” for your solution. Report a single value for the attribute “area”.

Question 6

What is the total distance travelled in km when walking from node 973 to node 1355 in the University Network (tables “carlton_edges” and “carlton_nodes”). Consider the network to

be undirected when doing your calculations.

Question 7

The University of Melbourne's athletic team is practising hard. As a part of their training strategy, each athlete is required to walk between 3 to 4 km every day as a warm-up exercise. They wish to undertake different routes every morning for the walk in the university network (tables "carlton_edges" and "carlton_nodes"). Considering that all the athletes meet at "Node 145", and return to this node along the same path, how many nodes in the network can be reached by walking between 1.5 to 2 km (both values inclusive) from Node 145?

Question 8

Find the maximum and minimum elevation above sea level of the Local Government Area of Victoria named "Mansfield". Use the tables "victoria_dem_30_o_2" and "victoria_lgas" in the spatial schema. Report two columns, "max_elev" and "min_elev", in metres.

Question 9

Find the name ("name"), length ("length"), the elevation of startpoint (start_elev), elevation of endpoint (end_elev), and elevation difference (diff_elev) of the 10 longest roads in the Melbourne OSM dataset (use the "melbourne_osm_roads" table in the "spatial" schema). Order the results based on the length of the road, from longest to shortest. Use the "victoria_dem_30_o_2" table as a source of the elevation information. You can use the nearest neighbour method to identify the height of a vertex.

Question 10

Find the highest point (elevation above sea level) inside the grounds (i.e., on any campus) of the University of Melbourne. Use "unimelb_campus" table as the University's area and "victoria_dem_30_o_2" for the elevation identification. Report the height ("height"), longitude and latitutde coordinates ("lon", "lat", respectively), and the name of the campus ("campus").